Math 241S- Review Sheet for 2nd Exam

The second midterm is Tuesday Nov. 10 and will cover Chapters 14.3-15.9, not including 15.4, and 15.5. As a good first step make sure you understand all the quiz problems and homework problems and examples worked out in class.

Definitions/Formulas to know:

- Partial derivatives.
- Tangent plane to a surface, tangent plane to a level curve.
- Linear approximation of a function.
- Total differential of a function.
- Chain rule.
- Directional derivatives
- Gradient, normal line to surface
- Local and absolute maxima, minima.
- Critical point, saddle point.
- Closed and bounded set.
- Extreme value theorem
- Method of Lagrange multipliers
- Double integral, double Riemann sum, triple integral
- Fubini's Theorem
- Average value of f(x,y) or f(x,y,z) on a domain.
- Equations for polar, cylindrical, spherical coordinates.
- Jacobian
- Change of variables theorem for double and triple integrals.

Skills you should have:

- Given a function f(x,y), find the tangent plane to the graph at a point. Find the linear approximation at a point. (14.4 #1-6, 11-16)
- Find the total differential for f(x,y) or f(x,y,z). (14.4 #25-30)
- Apply the chain rule to calculate partial derivatives (14.5 #1-26)
- Implicit differentiation via the chain rule. (14.5 #27-34)
- Calculate directional derivatives and gradients. (14.6 #4-20) Understand the significance of the gradient.
- Find the maximum rate of change of a function and the direction it occurs. (14.6 #21-26, 36, 38)
- Find equation of tangent plane and normal line to level surfaces. (14.6 #41-46)
- Apply the procedure in Section 14.7 to find critical points and determine, using the second derivative test, if they are local maxima or local minima. (p. 14.7 #5-20)
- Apply the extreme value theorem to find absolute maxima and minima of a continuous function on a closed bounded set. (14.7 #31-36, 41-53).
- Apply the method of Lagrange multipliers to find max and min of a function subject to one or two constraints. (14.8 #3-14, 17-23)
- Estimate double integrals using Riemann sums (15.1 #1-8)
- Evaluate double integrals using iterated integrals over rectangles, Type I and Type II regions. (15.1 15-34, 15.2 #1-10, 15-32)
- Evaluate double integrals by reversing the order of integration (15.2 # 45-56)
- Calculate average value of a function over a domain.
- Describe regions in polar coordinates, cylindrical coordinates, spherical coordinates.
- Evaluate double integrals using polar coordinates. (15.3 #1-32)
- Same as above except for triple integrals. (15.6 #3-22, 27-33).
- Evaluate triple integrals using cylindrical coordinates (15.7 #17-26, 29-30)
- Evaluate triple integrals using spherical coordinates. (15.8 #19-34)
- Evaluate integrals using an arbitrary change of variable. Understand the role of the Jacobian. (15.9 #1-20)